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The Passing of the Chair

Many of our overseas readers will be surprised to learn that, other than on experimental stretches, bull-head rails have been in use in this country for over a hundred years. However, last Friday, the Railway Executive announced their intention to standardise upon flat-bottom rails. Before railway transport became a State monopoly, there were in being 260 miles of track laid with flat-bottom rails and last year about 300 miles were added. For the laying of these rails, a sole plate replaces the chair. The complete replacement will take about a decade. Overseas readers may not realise the density of traffic on the railways of this country, but the fact that the Southern Railway in 1938 carried nearly as many passengers as the whole of the U.S.A. systems gives an insight into the existing problem. There seems to be quite a large number of reasons for this change, and outstanding amongst these are lowered cost of upkeep, smoother running, safety, and economy in raw material. Moreover, each mile of track laid with the new rails will require 16,900 fewer components than a similar length of bull-head track. With bull-head rails, the chairs were attached to the sleepers in the shops and, after spacing out along the track, the rails were dropped into position and secured by wooden wedges. With the new arrangement, the sole-plates and rails are assembled on site and secured to the sleepers by spring-steel spikes. There are to be only two types of flat-bottom rails, the choice of use being dependent upon the heaviness of the load normally carried.

There has grown up in this country a number of foundries, both privately owned and attached to the railway systems, which specialise in the production of chairs. Provided with excellent patterns, a long row of boxes and an equally long ridge of moulding sand, the moulder with a helper carried his pattern from box to box and filled up the floor with such remarkable rapidity that the best brains in the foundry equipment industry found it difficult to promise an equivalent output at a lower cost. They have at least promised to take the "donkey work" out of the job. The making of the sole plates is quite a different proposition. The casting is easy to mould, and quite well suited to mechanical production. In fact, those already in use have been made by this method. We were unable to to find out what grade of metal is to be used for these sole plates, and it does not yet seem to be certain whether they will or will not be replaced by steel forgings.

We have received the impression that much good could be done at this juncture by a talk between foundry interests and the executives responsible for specifying the properties of this, to us, relatively new component. On an average it is six pounds lighter than the chair, and of quite straightforward design. The standard chair was never a really simple casting, as it had to carry a jaw into which a wooden wedge was inserted alongside the rail for securing it. The sole-plate does not appear to us to be a component for the making of which a "sash weight" mix should be used. Moreover, it may be that the excellent vibration damping capacity of cast iron has a bearing on the subject, and knowledge of this resides within the industry, but is not widely known. We can assure the Railway Executive that, if asked, the foundry industry's scientists and technicians will be co-operative. The gradual passing of the old chair-foundry practice will cause but few tears, but will carry memories of a century of hard work well done by a body of men who have so long, and so worthily, upheld in their own field the production of essentially reliable iron castings.

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Craftsmen in the Ironfounding Industry

This is the title of the long-awaited pamphlet on youth recruitment compiled by a committee of the Council of Ironfoundry Associations, Crusader House, 14, Pall Mall, London, S.W.1. It has been well worth waiting for, as the publication has attained a particularly high standard. Especially commendable are the illustrations. The letterpress is clear, well written and to the point, but more might have been done with the headlines. Modern youth has been brought up in a world of slogans and headlines. Writing for youth is a special art, and whether the compilers have succeeded must await its reception. However, to get some basis for an opinion, the reviewer sought the impressions gained by the most "junior" member of his staff. He is undoubtedly above the average school-leaver in intelligence. After perusal of the booklet, he then knew what a foundry was like and how it was different from a steelworks. He was still a little vague as to what a foundry produced, and would have liked to see a series of pictures showing the sequences in the production of a casting. The incidence of dirt was dismissed as being of no importance. The prospects and limitations offered were obviously well understood and appreciated. Being already in employment, a clear statement of wages would have been appreciated. It was obvious that evening classes were an anathema to him. From this interview the only real point of interest was this question of "sequence of operations," but obviously, if the compilers had shown the making of, say, an automobile cylinder, it might disappoint a lad to learn that the nearest foundry making this line was 50 miles away, and that the local ones were very different. The reviewer fears that this is an insuperable difficulty. It is to be regretted that the field for obtaining reactions, not from grown-ups but from youth, is, to the reviewer, somewhat restricted. The sole criticism the reviewer makes is the absence of captions to the pictures. Here, indeed, a bad mistake has been made. For the rest there is nothing but praise and the committee responsible well deserve the thanks of the industry.

THE GREEN NATIONAL INSURANCE CARDS end on March 6, 1949, and are due to be exchanged before March 13. These cards have the letter "A" printed on the front page above the period of currency and also after the insured person's National Insurance number.

Employers are asked to take or send the green "A" cards of their staff and their own cards, if green, in bulk to a local National Insurance Office during the week beginning on March 7, 1949. In no circumstances should cards be taken or sent to Employment Exchanges of the Ministry of Labour as in the past.

The exchanged cards will be used for obtaining statistics of persons employed in different industries. To assist local National Insurance Offices in preparing these statistics, employers are asked, when sending in cards, to enclose a note of their name and address and the nature of their business.

Forthcoming Events

(Secretaries are invited to send in notices of meetings, etc., for inclusion in this column.)

FEBRUARY 7.

Institution of Production Engineers.

Yorkshire Section:—"Die Casting," by Dr. Street, at the Hotel Metropole, Leeds.

Institution of Works Managers.

Leeds Branch:—"Human Relationships," by Dr. J. F. Riches, at the Great Northern Station Hotel, Leeds, at 7 p.m.

FEBRUARY 8.

Leicester Branch:—"Standard Costs and Budgetary Control," by I. T. Morrow, at the College of Art and Technology, Leicester, at 7 p.m.

The Association of Bronze and Brass Founders.

Lancashire and Cheshire Area:—Informal Meeting of Members at the Midland Hotel, Manchester, at 12.30 p.m.

FEBRUARY 9.

Institution of Production Engineers

Luton Graduate Section:—"Die Casting," by R. W. Bailey, M.A., B.Sc.(Oxon), at the Town Hall, Luton, at 7.30 p.m.

Western Section:—"Induction Heating," by W. J. G. Cosgrove, B.Sc., at the Grand Hotel, Bristol, at 7.15 p.m.

Institute of Vitreous Enamellers

Southern Section:—Annual General Meeting at the Charing Cross Hotel, London, W.C.2, at 7.15 p.m.

Institution of Mechanical Engineers

Yorkshire Branch:—Visit to English Steel Corporation, Limited, Grimethorpe Works, Sheffield, 9, at 2.30 p.m.

FEBRUARY 10.

The Institute of Metals.

London Local Section:—"Metallic Corrosion," by T. P. Hoar, M.A., B.Sc., at 4, Grosvenor Gardens, London, S.W.1, at 7 p.m.

Institute of British Foundrymen.

East Anglian Section:—Film display—"Sandstorm Secrets" and "Mechanisation and Movement of Ferrous and Non-ferrous Metals," at the Central Library, Ipswich, at 7 p.m.

Lincoln Section:—"The Constant Charge System of Cupola Operation," by W. W. Braidwood, at the Lincoln Technical College, at 7.15 p.m.

FEBRUARY 11.

Manchester Association of Engineers.

"Rubber Machinery and its Uses," by E. Fcy, at the Engineers' Club, 17, Albert Square, Manchester, at 6.45 p.m.

Institution of Production Engineers.

Wolverhampton Section:—"Metallurgy," by Dr. T. Wright, at the Wolverhampton and Staffordshire Technical College, Wolverhampton, at 7.15 p.m.

Institute of British Foundrymen.

Middlesbrough Branch:—"Practical Moulding," by W. L. Hardy, at the Cleveland Scientific and Technical Institute, Corporation Road, Middlesbrough, at 7.30 p.m.

Birmingham Branch—Students' Section:—"Cupola Practice and Control," by L. W. Bolton, at the University, Edmund Street, Birmingham, at 7.15 p.m.

FEBRUARY 12.

Lancashire Branch:—"The Use of X-rays, Radium, and Radon in the Foundry," by G. M. Richie, M.A., at the Engineers' Club, Albert Square, Manchester, at 3 p.m.

Newcastle-upon-Tyne Branch:—"Patternmaking," by R. H. Smith, at the Neville Hall, Newcastle-upon-Tyne, at 6 p.m.

Scottish Branch:—"The Manufacture of Steel Castings," by T. R. Langley, at the Royal Technical College, George Street, Glasgow, at 3 p.m.

Conference Dates

The Annual Conference of the Institute of British Foundrymen will be held this year in Cheltenham from June 14 to 17. This advance information will enable intending participants to reserve these dates, though it is specifically requested that members should await full particulars before making any arrangements for accommodation.

Manganese Iron

A New Wear-resistant Material

*By P. F. Hancock, B.A.**

Introduction

The material, to which the name Manganese Iron has been given, was developed during the late war, with a view to its use for tank track links. In 1941-42, a number of the lighter types of British tanks were using track links of whiteheart malleable, which were not entirely satisfactory, either in shock resistance or resistance to wear. Austenitic manganese steel was, obviously, a desirable alternative and was already in use on some types, but steelfoundry production capacity did not permit its use on all. There was therefore a demand for a material of improved properties which could be made according to ironfoundry practice.

At this same time, initial development work on the gaseous annealing process for whiteheart malleable castings was in progress. Arising from this situation, the possibility was foreseen of a material which would have the same composition as manganese steel, except for a high carbon content, which would enable the material to be cast according to ironfoundry practice. The castings, so made, would be de-carburised by a gaseous annealing treatment to an average carbon content of about one per cent., and subsequently re-carburised in the surface layers so as to reproduce as nearly as possible the composition and metallurgical structure of cast manganese steel.

Early Experimental Work

Laboratory experiments on these lines proved highly successful. The final de-carburising treatment was found to be unnecessary, satisfactory properties being obtained by a de-carburising treatment only, followed by water quenching from 1,000 to 1,050 deg. C. This was a marked advantage, since it simplified greatly the required annealing procedure

After some further experiments on actual link castings, a number of experimental tracks were made up for the Valentine tank, the castings being made by a well-known malleable foundry, and the annealing treatment carried out in the laboratories of Birlec, Limited. These tracks were submitted to service trials (including comparative tests with tracks of standard manganese steel), which showed extremely promising results, the life of the new material being comparable with that of the manganese steel, and the rate of wear appreciably less.

At this time, the Valentine tank was becoming obsolete, and experimental work was transferred to links for a larger tank, the Cromwell, which was then coming into production. Experiments on large-scale production of these links were carried out in conjunction with another malleable foundry, employing cupola melting, and annealing in an electric batch-type furnace of about 1 ton capacity, with a controlled atmosphere, which was installed for this purpose.

A number of heats were made, and, in all about 20 tons of metal were cast, from which a reasonable proportion of sound castings was obtained and used for production-scale annealing tests, and to make up test sections of track. These large-scale experiments served to indicate the main characteristics of the material in the foundry, and to establish the outlines of operating procedure for production. Changes in the supply position, however, and other factors, precluded the adoption of manganese iron for tank tracks at that time (mid-1943), while its use for industrial purposes was prevented by a Government secrecy order on the material and process, which remained in force until 1945. With the ending of the war, commercial exploitation is now possible.

Applications of Manganese Iron

The probable field of application of manganese iron coincides with that which is at present covered by austenitic manganese steel castings. The principal characteristics are similar, i.e., a high degree of toughness and shock resistance coupled with exceptional wear resistance under conditions of heavy friction or abrasion. A disadvantage is that, like manganese steel, it is commercially unmachineable, except with hard-metal tools. It suffers from one other disadvantage, namely that it is only suitable for castings of fairly regular section, not exceeding about ¼ to ½ ins. Heavier sections cannot effectively be decarburised without an uneconomically very long annealing treatment, which would not be commercially practicable; there is a possible way of overcoming this difficulty; that is, to modify the composition of the alloy so as to render it graphitisable by increasing the silicon content and substituting part of the manganese content by nickel. Alloys of this type have been made, with satisfactory properties, in sections up to 2 in., but development has not yet been pursued beyond the laboratory stage. The above will serve to give a brief general picture of the history and present state of development of manganese iron, and it is now intended to discuss various aspects of its production and properties in greater detail.

Composition

For the straight manganese iron, which is to be annealed by de-carburisation only, experience has shown that the chemical composition of the as-cast alloy should lie within the following limits:—Manganese 12 to 15; carbon 3·0 to 3·5; silicon, less than 1·3; and phosphorus, less than 0·10 per cent.

The reasons for the choice of these limits are as follow:—With regard to manganese, alloys with less than 11 per cent. tend to have partly martensitic struc-

* Chief Metallurgist, Birlec, Limited.

Manganese Iron

tures after annealing, with poor strength and ductility, and the lower limit for manganese is therefore set at 12 per cent. At the upper end, with over 15 per cent. manganese, the foundry difficulties increase, but provided sound castings are obtained, satisfactory properties are obtained with up to 20 per cent. There is, however, no point in using more alloy than is necessary to give the desired properties, and the upper limit is therefore set at 15 per cent.

The as-cast carbon content is not critical from the point of view of final physical properties, but if too high, the material is excessively brittle in the as-cast condition, which makes its handling in the foundry difficult. (The carbon content after annealing is, of course, a function of the time and temperature of annealing, which, as already has been indicated, are adjusted to give a residual average value of about one per cent.) Silicon preferably does not exceed about 1·3 per cent., whilst phosphorus must not be higher than 0·10 per cent. or extreme intergranular brittleness appears. Sulphur is unimportant, but is normally below 0·02 per cent., due to the manganese sulphide reaction during melting, which eliminates most of that present in the raw materials.

For the graphitisable type of manganese iron, tentative composition ranges have been fixed from laboratory work and are:—Manganese 9·0 to 11·0; nickel 2·8 to 3·2; silicon 2·0 to 2·0; total carbon 3·0 to 3·3; and phosphorus, not more than 0·10 per cent.

Material lying within this range will be white as-cast in sections up to 2 in. and will graphitise sufficiently with a 40-hour anneal at 1,050 deg. C. to give reasonable ductility in the unaffected core.

Foundry Practice

Melting.—A number of alternative methods of melting are practicable, as follows:—(1) Straight cupola melting; (2) Cupola melting of the base iron, followed by mixing in the ladle with ferro-manganese separately melted in crucibles or in a cupolette; (3) Melting in electric-arc, or rotary fuel-fired furnace; and (4) Cupola melting of the base iron, followed by duplexing and addition of ferro-manganese and steel scrap in the electric-arc or rotary furnace.

The first of these, namely straight cupola melting, in which the whole charge, including the ferro-manganese addition is passed through the cupola, was employed with a fair degree of success in the experimental production runs at the malleable foundry which have already been referred to. With the cupola operated under somewhat reducing conditions (1:5 coke:metal ratio), and the ferro-manganese packed in canisters, the loss of manganese did not exceed about 1.5 per cent. when the normal proportion of back-scrap was included in the charge. With a virgin charge (*i.e.*, all the manganese present as ferro-manganese addition), the loss was under 0.5 per cent. There was no difficulty in achieving a suitable pouring temperature, the best range being found to be 1,300 to 1,350 deg. C. On the other hand, carbon pick-up was rather heavy, and this, added to the carbon content of the ferro-manganese (6 to 8 per cent.), made it difficult to keep the total carbon below 3.7 per cent., and it sometimes rose as high as 4.2 per cent. This high carbon content did not affect the properties of the castings after annealing, but it was objectionable in that it increased the tendency to cracking of the hard castings during knocking-out and cleaning. A somewhat lower carbon content could probably be achieved by running a lower coke ratio in the cupola, but this would certainly result in a greater and perhaps unpredictable loss of manganese. Cupola lining wear was not found to be excessive.

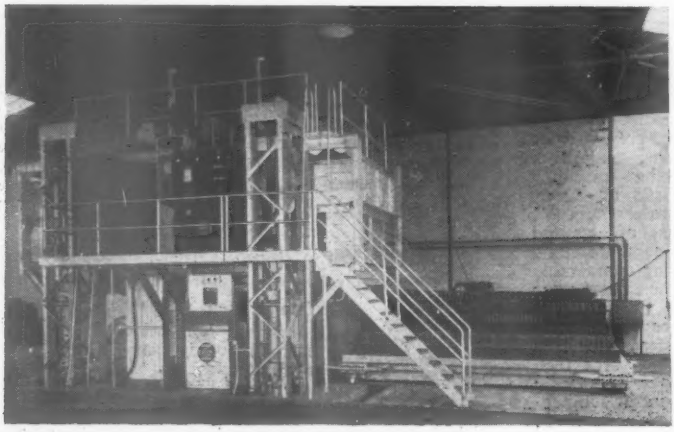


FIG. 1.—LARGE ELEVATOR-TYPE OF ELECTRIC FURNACE FOR ANNEALING, WITH SELF-GENERATING ATMOSPHERE.

The second method, cupola melting of the base iron with separate melting of the ferro-manganese followed by mixing in the ladle, was also tried out, and while this method overcomes some of the objections to straight cupola melting, it is not an easy one to apply under production conditions, due to the difficulty of accurately weighing small quantities of liquid metal.

The third and fourth methods, namely, straight melting or duplexing in electric-arc or rotary fuel-fired furnaces (as practised for blackheart malleable) have the advantage of ensuring full control of composition, and while the melting costs may be somewhat higher, this should be more than compen-

sated by a decreased scrap percentage. Of the two types of furnace, the electric-arc has a slight advantage, since there will be a fairly large (though predictable) loss of manganese under the highly oxidising conditions obtaining in the rotary furnace.

Moulding and Casting.—The standard practice, as employed for whiteheart malleable, has been found generally satisfactory. The overall shrinkage is somewhat higher than with malleable and about 30 per cent. greater allowance should be made in making patterns. Pouring temperatures should be between 1,300 and 1,350 deg. C., or a little higher if the carbon content be at the low end of the specification range. Too high a pouring temperature should be avoided, as it induces a coarse carbide structure with increased proneness to hot-tearing in the mould.

Cleaning and Fettling.—The castings should be knocked out hot from the boxes, and after knocking-off heads and risers, should be cleaned by sand-blasting. Fettling is preferably carried out after annealing since, in the hard state, it is difficult to grind the material without setting up surface cracks. It must be emphasised that the material is rather brittle in the as-cast condition (more so than malleable), particularly if the carbon content be on the high side, and care in handling is necessary if rejects due to cracked castings are to be avoided.

Heat-treatment

The heat-treatment given to the castings to render them ductile consists of a de-carburising anneal, followed by a water quench from 1,000 to 1,100 deg. The two operations may be combined, *i.e.*, the castings may be annealed at, say, 1,050 deg., followed by a direct quench from the annealing furnace. Alternatively, they may be given a normal anneal, as for whiteheart malleable, with furnace cooling, followed by a re-heating treatment in a separate furnace to 1,000 to 1,100 deg. C. and subsequent quenching.

Annealing may be carried out satisfactorily by any of the gaseous methods which have been developed in the last few years for whiteheart malleable. The furnace used must be gas-tight (*i.e.*, electric or radiant-tube gas-fired) and the de-carburising atmosphere must be of the type which is non-oxidising to the castings. The compositions and characteristics of such atmospheres have been widely discussed in recent years,* and it is not therefore necessary to describe them in detail. Suitable atmospheres may be prepared by partial combustion of coal-gas or producer-gas, or they may be of the "regenerative" type, *i.e.*, produced by reaction of air or steam injected into the furnace with the carbon content of the castings, under controlled conditions.

Various types of furnace may be used for the annealing treatment, and the best type in any instance will depend on production conditions in that particular foundry. For example, if the main product be whiteheart malleable, and only a small amount of manganese iron is to be made, it would pay to carry out the annealing in the whiteheart furnaces and install a small auxiliary batch-type furnace for re-heating and quenching. If, on the other hand, manganese iron were the main product, it would probably be better to install annealing furnaces adapted for direct quenching; in this case, a horizontal bogie-hearth, or batch-type furnace with charging machine, would be the type preferred. A large elevator-type furnace, suitable for the annealing treatment, and as used for whiteheart castings, is shown in Fig. 1. A batch-type furnace with a charging machine suitable for annealing with quenching or for re-heating for quenching only, is shown in Fig. 2.

Annealing temperatures in the range 1,050 to 1,075 deg. C. give the maximum speed of annealing consistent with a reasonable margin of safety (incipient fusion of the alloy in the as-cast state takes place at a little over 1,100 deg. C.). The annealing time to produce the optimum physical properties on the straight manganese iron depends on the average section of the castings, and the following figures give a rough guide for a temperature of 1,050 to 1,075 deg. C.:—

¼ in. section, 5 hrs.
½ in. section, 15 to 20 hrs.
¾ in. section, 30 to 40 hrs.
1 in. section, 55 to 70 hrs.

These times are required to give full de-carburisation to the centre of the section. This, however, is not usually necessary, and shorter times are often used, if a slight sacrifice of ultimate strength and ductility can be tolerated.

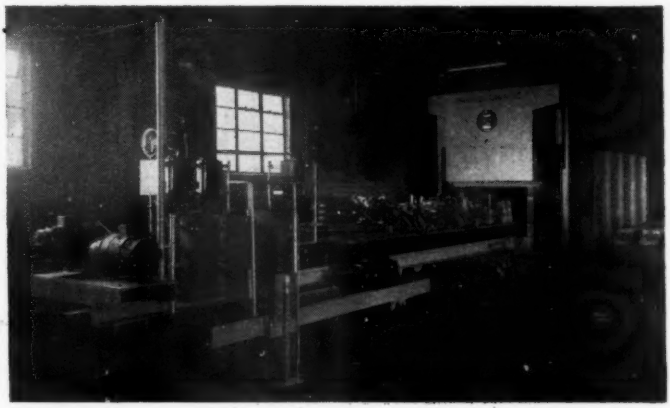


FIG. 2.—BATCH-TYPE FURNACE SHOWING CHARGING MACHINE IN THE FOREGROUND.

*Inst. Brit. Foundrymen, 1945, Paper 825. FOUNDRY TRADE JOURNAL, November 28, 1946.

Manganese Iron

For the graphitisable type of alloy, annealing times of about 40 hrs. at 1,050 to 1,075 deg. C. are suitable for any sections of ½ in. and over. Due to the brittleness of manganese iron in the as-cast state, castings should not be loaded into the annealing furnace at full temperature, or cracking will result. The furnace should be charged at not more than 600 to 650 deg., and heated to temperature at a speed of 100 deg. per hr. or slower. Small cracks are sometimes formed in quenching, particularly on the thinner sections of castings. Where these occur in lightly-stressed areas, they may be repaired by welding, using 18/8 stainless-steel electrodes.

Physical Properties

Tensile test bars of $\frac{9}{16}$ in. diameter in straight manganese iron, with an as-cast surface, annealed for 40-50 hrs. at 1,050 deg., or 30 to 40 hrs. at 1,075 deg. C., and water quenched, yield physical tests which mostly fall within the range:—

25 to 30 tons per sq. in. ultimate strength, and
12 to 20 per cent. elongation on 2 in. gauge length.

The ½ in. flat bend-test bars with the same treatment usually show a bend around a 2 in. diameter mandrel in excess of 180 deg. Other things being equal, tensile strength and elongation increase with increasing manganese content, as is shown in Fig. 3, which records these properties for a large number of heats of varying composition.

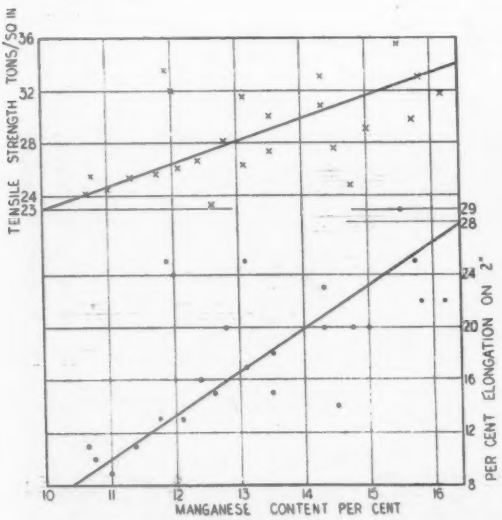


FIG. 3.—TENSILE STRENGTH AND ELONGATION FOR MANGANESE IRON PLOTTED AGAINST MANGANESE CONTENT.

The surface hardness of the material as annealed is about 250 to 300 V.P.N., but it increases extremely rapidly with cold working (much more so than does manganese steel), up to 600-650 V.P.N. This capacity for rapid work-hardening of the surface, confers the unusually high wear-resistance, which is the outstanding

FIG. 4.—MICROSTRUCTURE OF ANNEALED MANGANESE IRON. (× 150.)

characteristic of the material. On the other hand, it is this property also which renders it, like manganese steel, commercially unmachineable. It will be appreciated that since the physical properties of the straight manganese iron depend on the degree of de-carburisation, optimum results can only be obtained provided the castings are of fairly uniform section. This difficulty is partly overcome with the graphitisable type of alloy. This shows properties similar to the above in sections under ½ in. which are fairly well de-carburised, and in the heavier sections, which are not appreciably de-carburised but are partially graphitised, exhibits properties of the order of:—20 to 25 tons per sq. in. tensile strength, 4 to 6 per cent. elongation on 2 in. gauge length, and 25 to 35 deg. bend around a 2 in. diameter mandrel.

Metallography

The structure of both types of alloy in the as-cast condition consists of plates and dendrites of carbide in a matrix of manganiferous austenite. The process of de-carburisation during annealing, when carried out to the required degree, sets up a carbon gradient in the material, ranging from a low value of 0.1 to 0.2 per cent. at the surface up to a high value of about 1.5 per cent or over at the centre of the section. At the annealing temperature, the matrix structure is wholly austenitic, but after quenching in water, the structure obtained is related to the manganese and carbon content. Thus on an alloy of 12 per cent. Mn content de-carburised to the degree indicated above, the surface layers where the carbon is under 0.4 per cent. will consist of a mixture of austenite and martensite, the amount of martensite increasing towards the surface. Behind this layer, where the carbon ranges from 0.4 per cent. up to about 1.2 per cent., the structure will be wholly austenitic. At the centre of the section, where the carbon is above 1·2 per cent., a little carbide will probably be found in the grain boundaries and crystal planes, the amount varying inversely with the severity of the quench. With an alloy of 15 per cent. Mn. content, the same series of structures will be found, but the surface layer of mixed austenite and martensite will be thinner, since with this manganese content, martensite only appears when the carbon is below 0·25 per cent. If de-carburisation be not carried as far as in the above example, a residual core of carbon content and structure similar to the original as-cast alloy will remain at the centre of the section. It is generally found that a core of this kind, provided it does not exceed about 30 per cent. of the total thickness of the section, has only a very slight effect on the physical properties of the casting, and can be tolerated in most applications.

At the extreme surface, after de-carburisation, a thin layer of ferrite is sometimes found. This is caused by partial oxidation of the manganese content in this layer. It rarely exceeds 0·003 in. thickness and for practical purposes can be disregarded. A typical microstructure is illustrated in Fig. 4, which shows a $\frac{3}{16}$ in. diameter bar annealed for 35 hours at 1070 deg. C. There is a small residual core containing free carbide which can be seen at the bottom of the photograph; this is of a structure similar to the original as-cast material. Outside this core is a layer of coarse-grained austenite extending nearly to the surface, while the outer-surface layer consists of austenite and martensite.

With the graphitisable type of alloy, the structures obtained in de-carburised zones after annealing are generally similar to the above, but the unaffected core structure will consist mainly of austenite and graphite. There will also be a little residual carbide, since graphitisation rarely proceeds to completion except with very long annealing times. A typical microstructure is illustrated in Fig. 5, which shows the structure in the core of an annealed bar where no significant amount of de-carburisation has occurred. The matrix is austenite with nodules of graphite and a small quantity of carbide, mainly in globular form.

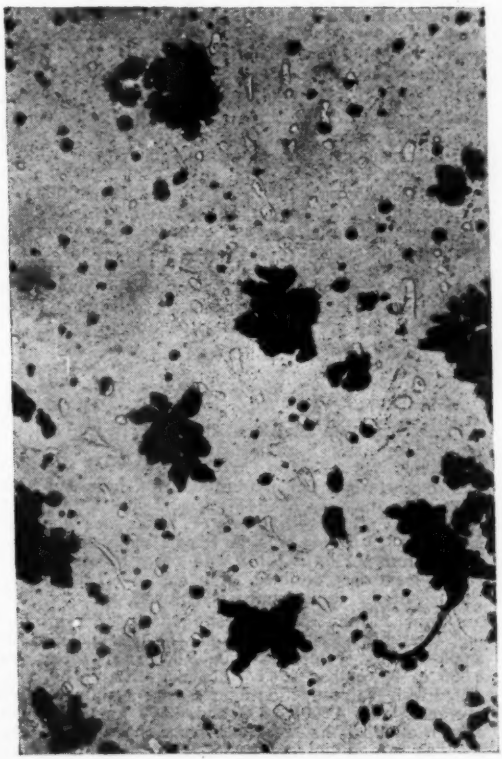


FIG. 5.—CORE MICROSTRUCTURE OF GRAPHITISABLE MANGANESE IRON AFTER ANNEALING. (× 150.)

Manganese Iron

Applications of Manganese Iron

The properties of manganese iron are generally similar to those of cast manganese steel, the strength and ductility being a little lower, and the wear resistance somewhat higher. Possible applications of the material are therefore visualised as falling in the field now covered by manganese steel, such as conveyor links, dredger parts, liners and other components for grinding mills, etc. The straight manganese alloy would be used for small castings of ruling section up to about ½ in., and the nickel-containing graphitisable type for heavier castings up to about 2 in. section.

It is likely, also, that manganese iron might displace whiteheart or pearlitic blackheart malleable in some applications (such as parts for agricultural implements) where a material of much improved wear resistance at very slight extra cost would be advantageous. In comparing it with these materials, however, the lack of machineability must be taken into account.

Production costs should be roughly the same as for blackheart malleable, while raw material costs will be somewhat greater due to the alloy content. For the straight manganese material, this increment will at the present time be of the order of £2 per ton, as compared with malleable, and for the nickel-containing graphitisable type, about £8 per ton. It is clear, therefore, that either type will compare very favourably in price with austenitic manganese steel castings. Both materials are protected in this country by British Patents No. 565,946 and 573,521 respectively, and grants have been made, or are pending, of corresponding patents in the principal foreign countries.

Latest Statistics

The December Statistical Bulletin issued by the British Iron and Steel Federation shows that when the count was taken on October 9, 1948, of the average numbers engaged in ironfoundries there had been a gain on the year of 7,475 persons, but a loss of 8 females; whilst the number of males has gone up from 130,829 to 138,272, the female staff has been reduced from 9,136 to 9,128. In other words, female employment has declined from 6.5 to 6.2 as a percentage of the total number employed.

During November the steelfoundries were producing steel for steel castings at the weekly rate of 8,600 tons as compared with 8,800 in October and 8,000 in November, 1947. The deliveries to be associated with the production figures, once again as weekly averages, were 4,500, 4,700 and 4,300 tons. For the eleven months, the weekly average has been 4,700, so that by multiplying by 52 this yields the more understandable figure, as the yearly output of the industry, of 244,400. However, one never knows, there may be 53 weeks in the counting period and a lowered production in December because of the holidays.

Forty Years Ago

The February issue of the "Foundry Trade Journal and Patternmaker" for February, 1909, gave itself a pat on the back because it had previously given warnings about the dangers of ferro-silicon and now it reported and commented upon the death of a fireman on board a ship carrying nine tons of the alloy from Antwerp to Grimsby. However, so far as steelfounders were concerned, a correspondent settled the problem by recommending the use of carbide of silicon. Nevertheless, the use of ferro-silicon has not only continued, but has done so in proportion to the steel output of the country.

In this issue a very high proportion of the articles are translations from the German—one on chills being particularly interesting.

There is an illustrated account of a set of very ornate gates made for the Maharajah of Mysore by Tonks, Limited, of Moseley Street, Birmingham. Each gate of the set weighed 30 cwt. and, should a photograph be available to-day, this masterpiece should be included in the propaganda literature of the non-ferrous foundry industry.

By 1909 the price of aluminium had reached a new "low," to use an Americanism. In twenty years it had fallen from £3,256 a ton to £65-£100. The mechanical properties of sand castings were of the order of 5 tons per sq. in. tensile, 2½ tons yield and 25 per cent. elongation.

Mr. George Hailstone showed very clearly that it was then possible to control the composition of cast iron, and few foundries to-day could show better graphs. He obviously revelled in experiments. He put ground coke on the surface of the ladles to keep the metal hot; used lead, zinc, or tin for making impurities rise to the surface by agitation, and adopted aluminium and titanium for "killing" and strengthening. This issue, containing more than 40 pages, is of a good sound vintage.

Chromium-Molybdenum Steel Castings

The British Standards Institution has recently published B.S. 1461-63 for chromium-molybdenum steel castings. This standard includes three specifications for steel castings for general engineering purposes in which the castings will normally be operating at temperatures in excess of 400 deg. C. For each specification the chemical composition of the steel is specified and the recommended heat-treatment procedure is given in Appendix A. Test requirements relate to the tensile and bend test, and provision is made for non-destructive tests, for hardness test after heat-treatment, and for hydraulic testing where appropriate.

Details are included of process of manufacture, fettling and dressing, freedom from defects, testing facilities, branding and repairs to castings. Appendix B gives recommendations with regard to welding procedure. Copies of this standard can be obtained from the British Standards Institution, Sales Department, 24, Victoria Street, London, S.W.1, at a cost of 2s., post free.

Castings for Internal Combustion Engines*

Discussion

(Continued from page 73.)

Wear-resisting and Alloy Irons

MR. VAN DER BEN, exhibiting some specimens of special liner iron, which was developed as the result of the attention that was given to liner wear, said that in essence it boiled down to a carbide network in a pearlitic matrix. The carbide network was preferable to the phosphide network for a variety of reasons, the principal one being that by working with a carbide network one was on the right side of the pearlite point. He had been in trouble with the machine shops as a result of this practice, but that was another story. With a carbide network one had no fear of ferrite; from the wear-resistance point of view, one did not want ferrite.

Referring to valve spindles, which, he said, were normally made in a heat-resisting, high-grade steel, he had made some in acicular iron in order to see what happened. After running for three years in a vertical engine, they were taken out and were found to be in excellent condition.

DR. W. F. CHUBB, discussing temperature control, said that in a film he had seen some time ago, a gentleman wearing a white coat had pointed a pyrometer at the metal at the moment of pouring and had nodded his head; casting had then proceeded. In the film exhibited by Mr. Van der Ben and Mr. Haynes, he had looked particularly for evidence that there was such temperature control, but he had not seen any; that did not mean, of course, that there was no such control, but he wondered what arrangements were made for controlling temperatures, for it was a highly important matter. Again, he said that in many repetition shops provision was made for the heat-treatment of castings, but he could not see any such provision in the general layout shown on the films.

Temperature Measurement

MR. HAYNES said they did not heat-treat any of their castings. They did not use instruments for measuring the temperature of the molten metal, but as the result of their experience they could judge it, even when using seven mixtures in the course of a day. When casting liners, for instance, he could tell by the appearance of the metal whether the temperature was satisfactory, and he could also tell what mixture of iron was used by just looking at the serrations of the metal. Test-bars were produced, of course, so that the metallurgist could make his analyses, test the metal for strength, and so on.

MR. VAN DER BEN added that he was rather suspicious of pyrometer readings, because in his experience one could have a pyrometer used by different people and one would get only an approximation instead of an accurate reading. Furthermore, if the person who was determining the temperature of the metal had not had a considerable experience, he could be misled. By the time one had finished experimenting, if one had a fair idea of what one was doing, one could probably get as near as was desired for practical purposes by using the eye. The disappearing-filament type of pyrometer seemed to be the only one available at present, and an oxide film, a light slag, or anything such as that on the metal surface would quickly affect the pyrometer reading. In experimental work a pyrometer was used, and on many occasions it had given results which were doubtful, so that eventually it had been necessary to decide, without the aid of the pyrometer, whether or not the condition of the metal was right for the purpose for which it was being used.

DR. CHUBB suggested that, to overcome such difficulties, the immersion type of pyrometer might be suitable. He had used it quite successfully on open-hearth furnaces at very high temperatures.

MR. VAN DER BEN agreed that that might provide the answer; but it was something of a heart-break, for he had found few sheaths which would withstand three immersions—and platinum elements were expensive. There were developments, however, in the way of non-metallic couples. He wanted something to embed in his Sesci furnace lining, for that would be a help. Incidentally, with the present shortage of pig iron, and so on, that melting unit was found to be extremely useful. They were able to convert borings into pig iron; using a charge of borings with some ferro-alloy addition; by adjustment one could make a very satisfactory pig iron. At his foundry they used hundreds of tons of it each year, so that they pretty well consumed their own smoke in that connection.

MR. A. A. MATTHEWS asked if it were really the fact that it was still possible, irrespective of climatic conditions, to judge by eye the temperature of metal to a high degree of accuracy.

MR. VAN DER BEN said he would not claim that the eye could always be as accurate as the pyrometer; but when the pyrometer was misbehaving it might give results which were further from the truth than were those obtained by eye.

MR. MATTHEWS said that at his foundry there was a pyrometer which hung on the wall as an ornament for considerable periods. But on a very dull day one might make a mistake when judging the temperature of molten metal by eye.

MR. VAN DER BEN agreed.

MR. HAYNES commented that they were not opposed to the use of instruments. But, with regard to MR. Matthews' last remark, he said that when it was raining they obtained hotter metal!

Encouragement of Young Moulders

MR. E. HARWOOD BROWN was particularly interested to know what steps were taken to bring the young men in the Authors' foundry to the stage of efficiency they had obviously reached; he was rather astounded that so many of the operators were so young as they were, and one would like to know what efforts were made technically or by specific education to help them.

*Film and Commentary presented by Mr. H. Haynes and Mr. C. R. Van der Ben to the London Branch of the Institute of British Foundrymen.

Making Engine Castings

Further, he wondered whether there was a lower "wastage" of youths in that particular foundry, and whether it was found that there was greater incentive due to greater interest in the work.

MR. HAYNES replied that he was a father to the boys in the foundry; he tried to imagine himself as a boy in their position, and, therefore, he took them into his confidence and talked to them. One rule he observed was never to swear in the foundry. As showing that he was always anxious to give them the opportunity to take responsibility, he said that if a man did not come to work, and if the boy who was assisting him in the making of a casting asked what he should do, he was told to get on with the making of the casting, and he would have all the help he needed. In those circumstances a boy was happy as a king. It was a good policy to allow the boys to make castings, whatever the cost, for thereby they became really interested.

One snag was that, after training a number of youths in a foundry, they had been attracted elsewhere by the offer of a little extra money. He himself did not try to take lads from other foundries; he tried to train lads of 15 years of age and upwards. During the past week he had lost six good lads who had been employed in the making of large and intricate castings. At the age of 18 years they had to go into the forces, but he would prefer that they should go to the forces at the age of 21, by which time they had finished their apprenticeship. In some cases he had noted that young men who had returned from service with the forces had found it difficult to give their minds to the work, and did not appear to have the same confidence and courage in their work as previously. He talked to the apprentices on practical foundry matters on Friday afternoons in the canteen, and later directed them to make castings. It was not often that they made bad castings; in any case, a man who had never made a bad one had never made a good one.

Paternal Guidance

A SPEAKER asked at what age the boys in Lancashire became men, for he had heard references to "boys" of 23 years of age.

MR. VAN DER BEN replied that those who had reached the age of 23 years had been boys recently and they had been brought up in the foundry: and in his foundry they had adopted the *pater familias* attitude and still addressed them as boys for some time. Some of them still acted as boys! But the considerable success achieved at his foundry he had attributed to the direct influence of Mr. Haynes; the handling of boys was a gift, and it was largely a matter of personality, which Mr Haynes possessed in large measure. It was important to give the boys the opportunity to take responsibility; the more they hung around on fiddling jobs, without assuming any responsibility, the more frustrated they became, feeling that the game was not worth the candle. If they were given a job to do they would not let one down.

MR. HAYNES added that it was necessary to shout at them at times; but one could talk to them in a friendly way afterwards, not merely on foundry matters, but on sport, and so on, and one did not lose their confidence; indeed, they appreciated it.

A SPEAKER asked what bond was used in the core sand.

MR. HAYNES replied that they tried out things until they were successful. They would use a mixture of 4 buckets of reclaimed sand, 1 bucket of red sand, and 6 lb. of oil.

Vote of Thanks

DR. A. B. EVEREST (Past-Branch-President), proposing the warm thanks of the meeting to Mr. Van der Ben and Mr. Haynes for the grand entertainment they had given, congratulated them particularly on their really excellent film. He added jocularly—bearing in mind Mr. Haynes' reference to the metal being hotter during wet weather—that perhaps the reason why there were so many iron foundries in Manchester was that apparently better iron was made when there was plenty of rain about.

MR. NICOL SMITH seconded. Recalling an earlier remark by the Branch-President that an impression once common was that foundry work did not require more than the average intelligence, he said it was obvious from the proceedings that evening that a very great amount of intelligence was being put into foundry work.

(The vote of thanks was accorded with enthusiasm, and both Mr. Van der Ben and Mr. Haynes responded.)

Book Review

Factory Law. (4th Edition.) By H. Samuels, M.A., Barrister-at-Law. Published by Stevens & Sons, Limited, 119 & 120, Chancery Lane, London, W.C.2. Price £2 5s. net.

A new edition of this standard work on factory law became essential with the arrival of the 1948 Factories Act. A major object of this edition is to provide the factory manager with a textbook setting out his obligations as the responsible occupier. The new conditions, whilst retaining the general provisions, are much more drastic. There has been much "tidying" and to-day the differentiation between textile and non-textile factories, and workshops no longer exists. Only mining and the like are excluded from its provisions. Factors in this large book—it runs to 674 pages—which will be appreciated by the layman are the clarity and simplicity of expression and the excellent indexing. For instance, foundry owners will find their duties in connection with limewashing; cleaning of floors; piecework and welfare, all neatly set out. So, too, will vitreous enamellers and brassfounders. The reviewer, being a layman with a scientific background, cannot help but be amazed at the extraordinary lack of precision in the wording of Acts of Parliament. For instance a crane has to be "of *good* construction, *sound* material, *adequate* strength and free from *patent* defect, and shall be *properly* maintained." The adjectives which have been italicised well illustrate the enormous and profitable field for interpretation by generations of lawyers still unborn. V. C. F.

Institute Elects New Members

At a meeting of the Council held at the Queen's Hotel, Birmingham, on January 15, the following were elected to the various grades of membership of the Institute of British Foundrymen:—

FIRST LIST

As Subscribing Firm Member

Sundry Equipment Manufacturers, 26, Pitsea Street, Stepney, London, E.1.

As Members

H. G. Batch, partner, West Croydon Pattern Company; W. Bradshaw, director and manager, Gardshaw, Limited, Sheffield; M. Britton, foundry owner, Barnsley; D. W. Brown, B.Sc. (Eng.), metallurgist, Morgan Crucible Company, Limited, London; T. M. Calvert, metallurgist, Elliott Bros., Limited, London; K. K. Cutt, proprietor, J. & K. K. Cutt, Limited, Lavenham, Suffolk; P. G. M. Freeman, managing director, R. Duckering, Limited, Lincoln; H. H. Gravener, partner, West Croydon, Pattern Company; M. G. Huber, metallurgist and melting manager, Georges Fischer, Schaffhausen, Switzerland; S. J. Kerr, managing director, Kerr Pattern Company, Limited, Lincoln; R. H. Rout, manager, pattern and model departments, National Gas Turbine Establishment; B. F. Stern, works manager and director, Tiverton Foundry Company, Limited, South Tottenham; H. N. Ward, director, H. Robinson Ward & Sons, Limited, Lincoln; T. C. Wilson,* foundry manager, J. Blakeborough & Sons. Limited, Brighouse; J. R. F. Waddell*, assistant foundry manager, J. Blakeborough & Sons, Limited, Brighouse; R. M. Ward, director, H. Robinson Ward & Sons, Limited, Lincoln.

As Associate Members

H. Boxley, foundry and patternshop foreman, Oakley Bros., Limited, Cradley Heath; E. F. Cookson, foundry and engineering draughtsman, C. & B. Smith, Limited, Wolverhampton; F. S. Cox, foreman patternmaker, Humber, Limited, Coventry; D. J. L. Drysdale, chief designer, Stone-Wallwork, Limited, London; E. W. Hair, moulder, Ley's Malleable Castings Company, Derby; G. E. J. Hannigan, lecturer, Medway Technical College, Kent; J. A. Harley, foundry foreman, Beeston Boiler Company, Notts; L. Hughes, sales executive, Hinckleys, Limited, Sheffield; W. G. Hutchings, foreman patternmaker, Hayward Tyler & Company, Limited, Luton; W. R. G. Johnson. technical representative, Stone-Wallwork & Company, Limited, London; T. B. Knight, chief metallurgist, Marshall Osborne & Company, Birmingham; A. E. Lewis, development metallurgist, Bristol Aeroplane Company, Limited; C. Marsden, foreman patternmaker, Newman Industries, Limited, Bristol; A. H. Mather, junior partner, Mather & Son, Ilford; N. Trumper, foreman patternmaker, C. & B. Smith, Limited, Wolverhampton; E. Willis, mechanical engineer, Marco Conveyor & Engineering Company, Limited, London; F. R. Woodward, foreman, Thos. Richards & Sons, Limited, Bristol.

As Associates (Over 21)

C. A. Bell, technical representative, Qualcast, Limited, Derby; K. A. Oliver, assistant metallurgist, C. Akrill, Limited; D. J. R. Rumley, foreman patternmaker, Thos. Richards & Sons, Limited, Bristol; R. S. I. Smith, student, Erifo Foundry, Limited, Erith; A. Sutherland, assistant to foundry plant engineer, Ruston & Hornsby, Limited, Lincoln; G. L. H. Woodthorpe, metallurgical chemist, Ruston & Hornsby, Limited.

As Associates (Under 21)

A. J. Crook, foundry apprentice, British Insulated Callenders Cables, Limited, Willenhall; G. H. Lilleyman, apprentice metallurgical chemist, S. Russell & Sons, Limited, Leicester; F. W. Pearce, apprentice metallurgist, Ruston & Hornsby, Limited, Lincoln; M. A. Totham, assistant metallurgist, Lake & Elliot, Limited, Braintree; R. J. Turner, apprentice moulder, Lake & Elliot, Limited, Braintree; J. W. Wiffen, foundry method engineer, Lake & Elliot, Limited, Braintree.

SECOND LIST

As Subscribing Firm Member

R. Berrie & Company, Limited, 125/127, Hydepark Street, Glasgow, C.3 (representative, Charles Morrison).

As Members

E. W. Barrell, production engineer, Bonnington Castings, Limited, Edinburgh; J. G. Boyle, foundry manager, John Brown & Company, Limited, Clydebank; J. M. Douglas,* assistant foundry manager, Glenfield & Kennedy, Limited, Kilmarnock; W. A. Dunlop, director, J. R. McKellar (Alloys), Limited, Glasgow; D. S. Gardner, assistant works manager, Glenfield & Kennedy, Limited, Kilmarnock; C. Morrison, foundry manager, R. Berrie & Company, Limited, Glasgow; W. S. Williams, managing director, Cross Foundry & Engineering Company, Limited, Gorseinon. Swansea.

As Associate Members

D. Allen, foundry manager's assistant, Hardings Castings, Warrington; J. V. Aspden, assistant foundry foreman, Howard & Bullough, Limited, Accrington; W. J. Cox, pattern moulder, Mitchell Russell & Company, Limited, Bonnybridge; T. Critchlev, manager, H. Smith & Company, St. Helens; A. D. Dickie, foundry manager, Wm. Dickie & Sons, Limited, East Kilbride, Ayrshire; F. Dulhanty, foundry foreman, P. R. Jackson & Company, Limited, Salford; R. Ferguson, head foundry foreman, Anderson Boyes & Company, Limited. Motherwell; W. J. Hill. foundry foreman, Evan's Foundries, Limited, Cardiff; R. K. Marshall, foreman moulder, Scottish Central Iron Company, Limited, Falkirk; J. Morris, foreman moulder, Glanmor Foundry Company, Limited, Llanelly; W. A. Pollock, manager, Robert Duncan (Partick Foundry), Limited, Glasgow; T. Robertson, assistant metallurgist, Glenfield & Kennedy, Limited, Kilmarnock; H. V. Sastry, instructor, Madras Technical Training Centre, India; A. C. Sneddon, patternshop foreman, Ferrous Castings, Limited, Warrington; W. H. Weston, ratefixer, Royal Ordnance Factory, Patricroft; J. T. Zyss, manager, Sutherland Zyss & Company, Sheffield.

(To be continued)

*Transferred.

Pig-iron and Steel Production in Great Britain

Detailed Figures for November

The following particulars of pig-iron and steel production in Great Britain have been extracted from the Statistical Bulletin for December, 1948, issued by the British Iron and Steel Federation. Table I gives the production of pig-iron and ferro-alloys in November, with the number of furnaces in blast at the end of the month; Table II, production of steel ingots and castings in November, and Table III, deliveries of non-alloy and alloy finished steel. Table IV summarises steel-industry activities during the six months ended November, 1948.

TABLE I.—*Weekly Average Production of Pig-iron and Blast-furnace Ferro-alloys, November, 1948.* (*Thousands of Tons.*)

District.	Furnaces in blast 27.11.48	Hematite.	Basic.	Foundry.	Forge.	Ferro-alloys.	Total.
Derby, Leics., Notts., Northants, and Essex	25	1.0	14.5	22.4	1.7	—	39.6
Lancs. (excl. N.W. Coast), Denbigh, Flints. and Ches. / Yorkshire (incl. Sheffield, excl. N.E. Coast)	6	—	0.8	—	—	1.7	8.5
Lincolnshire	14	—	25.0	—	—	—	25.0
North-East Coast	25	8.6	36.8	0.5	—	1.5	47.5§
Scotland	9	0.7	11.8	2.9	—	—	15.4
Staffs., Shrops., Worcs., and Warwick	9	—	8.6	1.4	—	—	10.0
S. Wales and Monmouthshire	8	4.3	19.0	—	—	—	23.3
North-West Coast	7	14.8	—	0.1	—	1.1	16.0
Total	103	29.4	122.5	27.3	1.7	4.3	185.3§
October, 1948	105	25.9	124.3	27.5	1.9	3.6	183.2
November, 1947	98	24.9	109.3	27.1	1.1	3.5	165.9

§ Includes 100 tons of direct castings.

TABLE III.—*Weekly Average Deliveries of Non-alloy and Alloy Finished Steel.* (*Thousands of Tons.*)

Product.	1947 (53 weeks).	1948 (1st 11 months).	1947. Nov.	1948. Oct.	1948. Nov.
Non-alloy Steel :—					
Heavy rails and sleepers	7.6	8.9	7.9	9.2	9.5
Heavy and medium plates	31.6	36.0	35.9	36.9	37.8
Other heavy products	31.8	34.8	34.1	35.6	36.4
Light rolled products (excl. wire rods and alloy-steel bars)	49.7	55.9	54.5	59.9	61.4
Ferro-concrete bars	3.2	4.1	3.7	4.5	4.5
Cold-rolled strip	4.6	4.7	4.9	5.0	5.0
Bright-steel bars	4.8	6.0	6.1	6.1	6.3
Sheets, coated and uncoated	24.3	26.3	26.7	27.4	26.9
Tin, terne and black-plate	12.1	13.5	13.3	12.8	15.1
Tubes and pipes	13.5	15.0	15.5	15.6	17.0
Wire	10.8	12.8	12.1	14.4	13.9
Tyres, wheels and axles	3.5	3.9	3.5	4.4	4.5
Forgings	5.0	5.8	6.4	6.7	6.3
Castings	3.0	3.5	3.5	4.0	3.8
Total	205.5	231.2	228.1	242.5	248.4
Alloy Steel :—†					
Tubes and pipes	0.3	0.4	0.5	0.3	0.4
Bars, plates, sheets, strip and wire	3.7	4.7	4.3	5.2	5.5
Forgings	1.8	2.4	2.0	3.0	3.0
Castings	0.6	0.7	0.8	0.7	0.7
Total	6.4	8.2	7.6	9.2	9.6
Total U.K. production‡	211.9	239.4	235.7	251.7	258.0
Less Inter-industry conversion	19.2	29.0	25.1	33.8	35.0
Total U K. deliveries	192.7	210.4	210.6	217.9	223.0
Add deliveries of imported finished steel	2.2	3.2	3.8	5.5	6.3
Total deliveries of finished steel	194.9	213.6	214.4	223.4	229.3

† Excludes high-speed steel.
‡ Includes finished steel produced in the U K. from imported ingots and semi-finished steel.

TABLE II.—*Weekly Average Production of Steel Ingots and Castings, November,* 1948. (*Thousands of Tons.*)

District.	Open-hearth. Acid.	Open-hearth. Basic.	Bessemer.	Electric.	All other.	Total. Ingots.	Total. Castings.	Total ingots and castings.
Derby, Leics., Notts, Northants and Essex	—	—	10.9(Basic)	0.9	0.2	11.4	0.6	12.0
Lancs. (excl. N.W. Coast), Denbigh, Flints. and Ches. / Yorkshire (excl. N.E. Coast and Sheffield)	1.7	22.6	—	1.2	0.4	24.9	1.0	25.9
Lincolnshire	—	29.1	—	—	0.1	29.1	0.1	29.2
North-East Coast	1.7	58.2	—	0.7	0.5	59.5	1.6	61.1
Scotland	5.0	39.7	—	2.2	0.8	45.9	1.8	47.7
Staffs., Shrops., Worcs. and Warwick	—	14.6	—	0.6	0.8	14.7	1.3	16.0
S. Wales and Monmouthshire	10.3	45.1	5.5 (Basic)	0.9	0.1	61.6	0.3	61.9
Sheffield (incl. small tonnage in Manchester)	9.5	24.0		7.7	0.6	40.0	1.8	41.8
North-West Coast	0.6	2.5	4.0 (Acid)	0.3	0.1	7.4	0.1	7.5
Total	28.8	235.8	20.4	14.5	3.6	294.5	8.6	303.1
October, 1948	28.9	231.0	19.4	14.3	3.6	288.4	8.8	297.2
November, 1947	24.8	214.2	17.3	12.8	3.5	264.6	8.0	272.6

(*Continued at foot of facing page.*)

Obituary

MR. ANDREW ROBSON, principal of Handsworth Technical College, died on January 17.

MR. GEORGE M'GREGOR, of the Ardeer Foundry Company, Limited, Stevenston, Ayrshire, died suddenly on January 21.

MR. PETER MORRISON, a former manager of the Wear Copper and Brass Works (now closed down), has died suddenly at the age of 76.

MR. THOMAS RENNIE STOKES, a partner in the Garfield Engineering Company, Limited, Wolverhampton, has died at the age of 53.

MR. JAMES FRASER EWEN-FARRELL, of the electrical engineering department of Glasgow Royal Technical College, died suddenly on January 22.

MR. ROBERT HAMILTON PAIRMAN, formerly secretary of the Scottish Boiler & General Insurance Company, Limited, Glasgow, died on January 18.

MR. JOSEPH WRAGG, who died recently, was for many years chairman of Thomas Wragg & Sons (Sheffield), Limited, fireclay miners and manufacturers of refractory goods.

MAJOR A. TOWER ROBERTSON, who was senior partner and managing director of the old Tweed Iron Works which closed down 25 years ago, has died at Berwick at the age of 94.

MR. W. K. GIBBS, head buyer of Heenan & Froude, Limited, structural manufacturing engineers, etc., of Worcester, collapsed and died on January 17. He had been with the company for 40 years.

MR. ARTHUR SKINNER, who had been in ill-health for some time, died on January 22 at the age of 81. He was formerly works manager and a local director of Hadfields, Limited, Sheffield, retiring in 1931 after 36 years' service with the company.

MR. PETER WHITE, joint general manager of William Pickersgill & Sons, Limited, shipbuilders, of Sunderland, has died at the age of 55. Mr. White, who was commercial manager before his appointment as joint general manager three years ago, had been with the company for 30 years.

MR. STANLEY RICHARD CLAY, a director of Broom & Wade, Limited, engineers, of High Wycombe, died in a Johannesburg nursing home on January 22. He was on his way to visit the company's South African house, and caught a chill on the voyage and died shortly after his arrival in Johannesburg. Mr. Clay, who was born on January 1, 1888, served an apprenticeship with Lee, Howl & Company, Limited, manufacturers of pumps and hydraulic plant, of Tipton, Staffs. Afterwards he joined a firm of consulting engineers in Birmingham and later represented Broom & Wade, Limited, and the Mining Engineering Company, Limited, in the Midlands and South Wales. In 1925 he went to Broom & Wade's head office at High Wycombe as sales manager. He became sales director in October, 1927, since when he has been in complete charge of the company's sales throughout the world. The success which he has achieved is shown by the growth of the business and the fact that during last year the firm exported air compressors and pneumatic tools to no fewer than 83 different foreign countries. In recent years, Mr. Clay has been a member of the Ministry of Works' Advisory Committee on Contractors Plant.

LORD MELCHETT, formerly deputy chairman of Imperial Chemical Industries, Limited, died at Miami, Florida, on January 22, at the age of 50. He had been in poor health for some time. Lord Melchett had been associated with I.C.I., Limited, both as a director and in an executive capacity, since the company's formation in December, 1926. He was deputy-chairman from 1940-47, resigning from the board on medical advice in July of last year. He was also a director of Ashmore, Benson, Pease, Limited, Stockton-on-Tees, the International Nickel Company of Canada, Limited, the Mond Nickel Company, Limited, and other companies. In 1923 he was elected Liberal M.P. for the Isle of Ely, but he left the Liberal Party in the following year and was out of Parliament for five years, re-entering it in 1929 to represent the East Toxteth Division of Liverpool in the Conservative interest. He vacated the seat on his accession to the peerage on the death of his father the next year. After leaving the House of Commons Lord Melchett devoted more interest to economics and industry. He was deeply concerned in the economic difficulties of the day and advocated the creation of a chamber of 100 to 150 people as a sort of third House of Parliament, composed partly of industrialists and financiers, partly of scientists and economists, and partly of Ministers; he held that such a body could solve the economic problem. He was the author of several books, including "Modern Money," and "Why the Crisis?"

PIG-IRON AND STEEL PRODUCTION IN GREAT BRITAIN (*Continued from previous page*).

TABLE IV.—*General Summary of Pig-iron and Steel Production.* (*Weekly Average in Thousands of Tons.*)

Period	Iron-ore output.	Imported ore consumed.	Coke receipts by blast-furnace owners.	Output of pig-iron and ferro-alloys.	Scrap used in steel-making.	Steel (incl. alloy). Imports.‡	Output of ingots and castings.	Deliveries of finished steel.	Stocks.†
1938	228	89	—	130	118	16	200	—	—
1946	234	115	169	149	147	8	244	192	1,068
1947 (53 weeks)	209	130	165	147	145	8	240	195	797
1948—June*	257	171	206	181	180	8	297	223	886
July	253	156	201	171	144	7	282	184	920
August	233	163	200	174	162	6	271	182	986
September* ..	273	166	202	181	183	10	297	225	1,002
October	270	166	202	183	184	13	297	223	1,004§
November	264	165	205	185	187	13	303	229	1,001

* Five weeks. † Stocks at end of years and months shown. ‡ Weekly average of calendar month. § Revised.

News in Brief

A DISCARDED IRONFOUNDRY at York has been converted into a worsted mill.

TAYLOR, LAW & COMPANY, LIMITED, tin and iron plate workers, of Stourbridge, celebrated its 50th anniversary last month.

PLANS have been approved by Sunderland Town Council for works extensions for the Jennings Winch & Foundry Company, Limited.

A DRIVE to interest youths in the engineering industry, which is suffering seriously from a dearth of recruits, is to be undertaken by the Engineering Centre in Glasgow.

ALDERMAN AND MRS. J. C. BURMAN, Lord and Lady Mayoress of Birmingham, when in Belfast recently, visited the foundry of Musgrave & Company, Limited, fan and structural engineers.

THE NEW £240,000 DEPARTMENT of mechanical engineering being built at Newcastle-upon-Tyne for King's College will be completed, it is hoped, by 1951. It will accommodate 750 students.

A CONTRACT for over 1,000,000 ft. of locomotive boiler and flue tubes has been placed with Tube Investments, Limited, by the Spanish Railways, Red Nacional de los Ferrocarriles Espanoles, Madrid.

CONSETT IRON COMPANY'S No. 2 blast furnace, built in 1943, has reached the million-ton mark in high-grade pig-iron production. It was the first fully mechanised blast furnace to be established by the company at Consett.

THE OFFICE of the Salem Engineering Company, Limited, in Sheffield, was closed on Saturday; the headquarters of the company are now at Milford House, Milford, near Derby (telephone: Duffield 2271).

IT WAS ANNOUNCED last Thursday afternoon that British Railways are to use new standard types of rail of the flat-bottom type instead of the traditional bull-head type. The new rails will weigh 109 and 98 lb. per yd.

THE FEDERATION OF BRITISH INDUSTRIES has joined other manufacturers' organisations in making representations to the Chancellor of the Exchequer for the rebate of the duty on light hydrocarbon oils used in processes of manufacture.

THE CONSERVATIVE POLITICAL CENTRE is holding an area conference during the week-end of February 19 and 20 at the Grand Hotel, Harrogate, to deal with steel and nationalisation. Details are available at 53, Great George Street, Leeds, 1.

ELEVEN EMPLOYEES of Evered & Company, Limited, brassfounders, gas lighting engineers, etc., of Smethwick, received long-service awards from Mr. A. Wilson, managing director, who also received an award from his father, Mr J. H. Wilson, chairman of the company.

THOS. W. WARD, LIMITED, Sheffield, has taken over world sales distribution for "Eldair" press brakes and for the precision gauges manufactured by K. Emsley, Limited, Bradford. Ward's has also been appointed selling agents throughout the world, with the exception of Australia, for the 10½-in. lathe of Darling & Sellers, Limited, Keighley.

THE CHAIRMAN of the Council of Industrial Design (Dr. R. S. Edwards) said recently that it was intended that exhibits for the 1951 Festival of Britain should be confined to articles of current design and production. The festival must show the world that British designs were in advance of those of the rest of the world. The preparation of a "stock list" of possible items for inclusion in the exhibiton had already begun.

ALBERTA OXYGEN & ACETYLENE COMPANY, LIMITED, 142nd Street at 108th Avenue, Edmonton, Alberta, Canada, wishes to import from the United Kingdom apparatus and equipment used in both oxy-acetylene and electric welding processes. Interested companies should contact the firm direct, at the same time notifying the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, London, S.W.1 (reference, E.P.D. 42624/48), of any action taken.

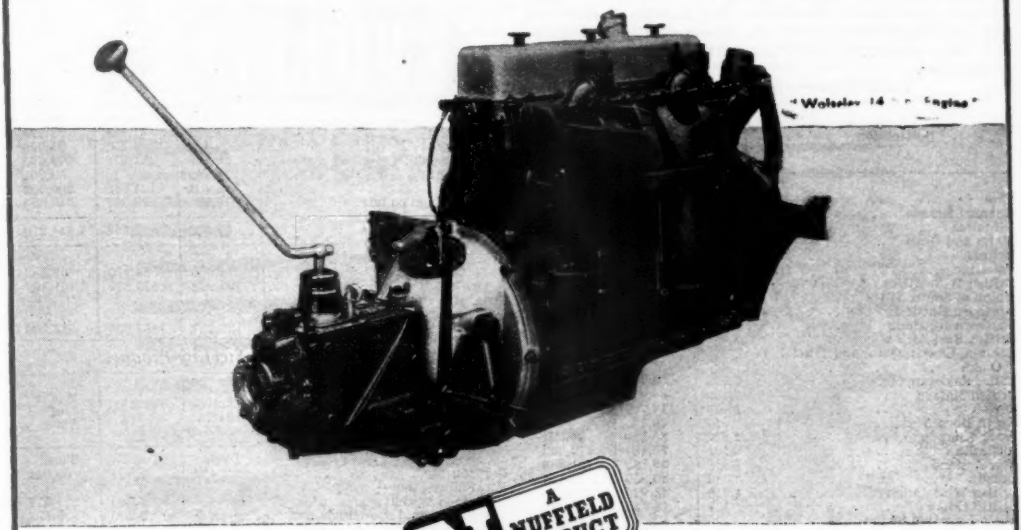
IN OUR ISSUE of January 20, when referring to Dr. J. E. Hurst's appointment with the Bradley & Foster group of companies, following the death of Mr. G. T. Hunt, it was stated that two new directors, Mr. Simon Neville Turner and Mr. G. E. Lunt, had been appointed to fill Dr. Hurst's vacancy on the board. The reference should have been to Mr. G. T. Lunt's vacancy, as Dr. Hurst retains his seat on the board of the Bradley & Foster group, now being managing director.

ANNOUNCING that the business was being carried on under his supervision, Mr. David Morgan, liquidator of the Crittall Kitchen Equipment Company, Limited, stated that substantial orders had been received and would keep the works occupied for some time. The company, formed in 1934, was one of the subsidiaries of Richard Crittall & Company, Limited, Brentford, which, it was pointed out by the chairman of the parent company at the annual meeting last October, would have to be wound up and there would be a substantial loss.

GRANGEMOUTH HAD IMPORTED a quarter of a million tons of scrap last year—not a bad record—stated a local dock official on January 21, in reply to criticisms made by Mr. Charles Murdoch, chairman of the Scottish Board for Industry, that after efforts made by the Board to increase scrap imports, Grangemouth could not handle traffic and ships were kept waiting. A local shipping official said the hold-up was due to steelworks being unable to empty wagons fast enough. On one occasion recently overtime work was stopped because no empty wagons were available.

Distribution Census Postponed

The Government has decided to postpone the census of distribution for one year. Announcing this in the House of Commons, Mr. Harold Wilson (President of the Board of Trade), said that during the last two months he had received communications from M.Ps on both sides of the House and from trade organisations which showed that many engaged in the distributive trades had not become sufficiently acquainted with the form that the census would take or their responsibilities in connection with it.



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Imports and Exports of Iron and Steel

The following tables, based on Board of Trade returns, give figures of imports and exports of iron and steel in December and for the whole of 1948. Figures for the whole of 1938 are given for purposes of comparison.

Total Exports of Iron and Steel.

Destination.	December, 1948.	Twelve months ended December.	Whole of 1938.
	Tons.	Tons.	Tons.
Eire	6,131	69,388	55,719
Channel Islands	815	11,330	7,417
Gibraltar	322	3,263	883
Malta and Gozo	354	5,267	2,304
Cyprus	131	3,969	1,656
Palestine	1,230	14,625	8,071
British West Africa	4,936	48,610	49,742
Union of South Africa	13,240	148,328	231,086
Northern Rhodesia	820	12,335	20,574
Southern Rhodesia	2,027	29,233	36,212
British East Africa	8,060	71,214	25,931
Behrein, Loweit, Qatar and Trucial Oman	2,036	27,386	*
India, Pakistan, etc.	7,572	84,708	168,679
British Malaya	5,450	36,917	66,584
Ceylon	2,095	14,738	26,030
North Borneo	574	10,505	115
Hong Kong	2,863	35,119	23,594
Australia	8,101	79,454	170,903
New Zealand	7,899	69,199	131,883
Canada	3,322	30,859	85,409
British West Indies	4,210	41,920	44,250
British Guiana	437	4,792	2,996
Anglo-Egyptian Sudan	706	10,034	8,290
Other British countries	2,319	19,887	13,964
Russia	3,572	21,314	4,349
Finland	8,639	75,587	17,607
Sweden	6,585	89,924	11,974
Norway	6,593	70,117	20,273
Iceland	873	5,380	658
Denmark	10,118	90,321	87,255
Poland	88	2,423	2,487
Netherlands	15,247	96,969	51,559
Belgium	951	11,030	20,325
France	1,844	17,032	13,287
Switzerland	1,612	17,136	2,781
Portugal	2,677	24,797	7,713
Spain	1,408	7,149	7,763
Italy	394	5,248	5,139
Hungary	4	928	32
Czechoslovakia	117	732	2,315
Greece	616	4,484	1,752
Turkey	2,888	22,547	13,757
Dutch East Indies	2,123	24,213	27,307
Dutch West India Islands	919	7,816	2,464
Belgian Congo	168	1,441	304
Algeria	9	625	52
Portuguese East Africa	406	3,046	14,220
Syria	351	2,964	2,693
Lebanon	5,692	20,469	
Egypt	4,547	47,990	34,409
Iraq	1,554	45,391	25,740
Iran	3,132	100,906	110,380
Burma	1,252	26,975	18,512
Siam (Thailand)	664	3,076	5,997
China	1,564	16,777	22,509
U.S.A.	526	10,455	2,187
Cuba	36	1,841	722
Colombia	448	7,264	3,823
Venezuela	6,197	60,263	4,675
Ecuador	207	3,265	1,592
Peru	228	2,987	3,031
Chile	333	9,251	6,293
Brazil	1,520	18,722	16,990
Uruguay	1,048	8,128	7,587
Argentine	8,905	108,125	79,357
Other foreign countries	3,216	32,127	81,700
Total	195,821	2,010,315	1,915,275

* Included in "Other British countries" and "Other foreign countries."

Total Imports of Iron and Steel.

From	December, 1948.	Twelve months ended December.	Whole of 1938.
	Tons.	Tons.	Tons.
Australia	388	15,007	35
Canada	5,864	78,283	117,374
Other British countries	186	5,658	161,231
Sweden	1,470	16,302	89,795
Norway	1,735	31,188	33,774
Germany	152	4,552	95,998
Belgium	28,146	207,078	273,680
Luxemburg	5,745	29,516	58,601
U.S.A.	5,404	103,612	200,692
Other foreign countries	16,132	76,357	313,090
Total	65,222	567,553	1,344,270
Iron ore and concentrates			
Manganiferous	4,000	54,170	62,282
Other sorts	491,248	8,675,579	5,101,867
Iron and steel scrap and waste, fit only for the recovery of metal	122,281	857,634	632,203

Exports of Iron and Steel by Product.

Product.	December, 1948.	Twelve months ended December.	Whole of 1938.
	Tons.	Tons.	Tons.
Pig-iron	423	1,504	93,941
Ferro-alloys, etc.—			
Ferro-tungsten	203	1,080	517
Spiegeleisen, ferro-manganese	225	3,236	5,197
All other descriptions*	67	786	1,048
Ingots, blooms, billets and slabs	357	5,804	9,743
Iron bars and rods	693	6,551	3,197
Sheet and tinplate bars, wire rods	584	4,581	15,560
Bright-steel bars	1,940	23,166	6,589
Other steel bars and rods	12,371	116,959	102,003
Special steel	1,345	18,291	4,933
Angles, shapes and sections	10,824	97,757	66,872
Castings and forgings	490	5,978	1,618
Girders, beams, joists and pillars	2,614	20,943	33,471
Hoop and strip	4,054	42,303	37,377
Plate, ⅛ in. thick and over	22,860	136,667	130,959
Black plates	—	38,738	14,538
Black sheets	12,623	73,239	63,513
Galvanised sheets	6,535	90,231	146,933
Tinplates	17,183	195,245	319,308
Tinned sheets	701	6,088	1,410
Terneplates	6	197	4,325
Decorated tinplates	479	2,446	4,368
Other coated plates	201	3,338	225
Cast-iron pipes, up to 6-in. dia.	5,540	66,041	48,928
Do., over 6-in. dia.	7,393	61,231	42,963
Wrought-iron tubes	24,068	295,554	219,973
Radiators and central-heating boilers	191	3,215	4,028
Railway material	19,827	193,697	158,153
Wire	3,727	40,598	55,181
Cable and rope	2,326	27,124	16,400
Netting, fencing and mesh	1,100	17,405	9,417
Other wire manufactures	1,280	10,366	3,671
Nails, tacks, etc.	641	7,588	3,806
Rivets and washers	857	9,371	8,536
Wood screws	346	4,242	2,512
Bolts, nuts and metal screws	1,813	22,232	17,573
Stoves, grates, etc. (excl. gas)	872	11,524	7,005
Do., gas	231	2,969	2,145
Sanitary cisterns	125	1,596	2,812
Fencing material	347	3,126	5,130
Anchors, etc.	628	9,313	6,336
Chains, etc.	739	9,161	6,293
Springs	823	7,237	3,931
Hollow-ware	6,020	72,532	10,702
All other manufactures	20,149	239,065	212,735
Total	195,821	2,010,315	1,915,821

* The figures for 1938 are not completely comparable with those of subsequent years.

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Personal

MR. T. POWELL has been appointed general manager of the British Electro Metallurgical Company, Limited, Wincobank, Sheffield.

THE EARL OF MEATH has resigned from the board of the Monotype Corporation, Limited, composing-machine manufacturers, of Redhill, Surrey.

MR. E. SKERRY and MR. H. DOLAN have been re-elected chairman and secretary, respectively, of the Sheffield branch of the Institution of Engineering Inspection.

MR. THOMAS MEEHAN, North-East divisional officer of the Iron and Steel Trades Confederation, is to received the freedom of the Borough of Middlesbrough yesterday (Wednesday).

MR. ERNEST BRYAN, sales manager of Metal Sections, Limited, Oldbury (a subsidiary of Tube Investments, Limited), has left England for an extended tour of India and Pakistan.

MR. F. C. EVANS, formerly general manager of Langley Alloys, Limited, has joined John Miles & Partners (London), Limited, consulting engineers in the iron and steel and non-ferrous industries.

MR. FRANK SHEPHERD, personnel manager of Head, Wrightson & Company, Limited, engineers and iron-founders, of Thornaby-on-Tees, is leaving for a two months' tour of the United States during which he will study foundry methods and conditions.

DR. F. A. FOX has relinquished his appointment as deputy director of the British Welding Research Association and is joining H. J. Enthoven & Sons, Limited, lead smelters and refiners and metal merchants, of West Croydon, as deputy technical director.

MR. KENNETH J. BURTON, of the British Employers' Confederation, has been appointed a joint secretary of the Anglo-American Productivity Council in addition to Sir Norman Kipping (Federation of British Industries) and Mr. Vincent Tewson (Trades Union Congress), who already act in that capacity.

MR. JAMES CALDERWOOD has resigned his appointment as manager of the Diesel and marine department of Sulzer Bros. (London), Limited, to join Associated British Oil Engines, Limited, as technical director. He will be in charge of all design and development at each of the five factories where Diesel engines are at present being built.

MR. CHARLES SMITH has been appointed a local director of John Smith (Keighley), Limited, engineers and crane builders in which Thos. W. Ward, Limited, Sheffield, holds a controlling interest. He is a grandson of John Smith, the founder of the firm, which was established in 1866, and has been with the company more than 30 years.

DR. F. C. LEA, a director of Edgar Allen & Company, Limited, steel manufacturers, of Sheffield, has been appointed an honorary member of the Institution of Mechanical Engineers. Dr. Lea, who is an emeritus professor of Sheffield University and was Dean of the Faculty of Engineering there from 1923-36, was president of the Institution in 1943-44.

MR. T. SAMPSON has, for health reasons, relinquished his position as joint managing director of W. Crockatt & Sons, Limited, engineers, of Glasgow, and has severed his connection with the company. MR. WILLIAM C. CROCKATT continues as chairman and joint managing director with MR. P WILSON as joint managing director and secretary of the company.

DR. FREDRIK LJUNGSTRÖM, of Sweden, has been awarded the James Watt International Medal by the Council of the Institution of Mechanical Engineers, for his outstanding contributions to the development of mechanical engineering, the most notable of which are the air preheater which bears his name, and the steam turbine developed jointly with his brother, the late Birger Ljungström.

MR. JOHN DAVISON LEECH, plant foreman at the Billington works of Imperial Chemical Industries, Limited, has been awarded the company's bronze medal for bravery. He received the award for "exemplary devotion to duty, outstanding courage, and extraordinary presence of mind in most difficult and dangerous circumstances" when an explosion occurred in the ammonia works at Billingham on December 8.

SIR WILLIAM CURRIE, a director of R. & H. Green & Silley Weir, Limited, ship and engine repairers, etc., of Milwall Docks, Roath Engineering Company, Limited, Cardiff, and other companies, has been elected Prime Warden of the Worshipful Company of Shipwrights. SIR HAROLD FLANNERY, a director of Flannery, Baggallay & Johnson, Limited, consulting engineers, of Fenchurch Street, London, E.C 3, and other companies, has been elected Third Warden of the Company.

MR. C. T. ALLAN, who was elected president of the South Wales Institute of Engineers on January 20, was educated at St. John's College, Preston, and Wakefield Grammar School, before proceeding to Finsbury Technical College, London. As an engineer with the Westinghouse Company, he put into service in Sweden the first electric locomotive. He also erected plant at Willesden and Bankside power stations, London, and was in an executive capacity at the commencement of London's underground railways. For the long period of 34 years he was chief engineer and assistant manager of the South Wales Power Company. A former hon. secretary of the Western branch of the Institution of Electrical Engineers, Mr. Allan also took a keen interest in social welfare and served on many committees connected with industry.

Wills

TAYLOR. CAPT. E., a director of British Insulated Cables, Limited	£101,691
SHAW. G. F., a co-director of H. F. Shaw, Limited, manufacturers of odd ironwork, of Old Hill, Staffs	£16,007
BOYES, J. E. C., managing director of W. J. Boyes & Son, Limited, Diesel engineers, of Peckham, London, S.E.15	£28,461
WRAY, G. B., a director of Wray, Richardson & Company, Limited, textile engineers, metal stampers, etc., of Keighley	£21,079
PRESTWICH, M. E., managing director of Prestwich, Parker & Company, Limited, nut and bolt manufacturers, of Atherton, Lancs	£126,271

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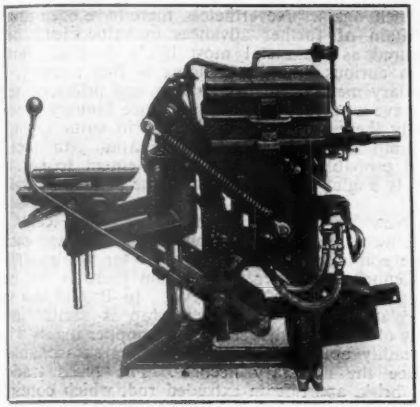

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Raw Material Markets

Iron and Steel

Blast-furnace production is fairly constant, but, in the aggregate, supplies of pig-iron fall short of current requirements, and it is evident that a balance can only be achieved between supply and demand by the operation of more furnaces. Of this there is no immediate prospect except in Northamptonshire, where an extra stack is to be employed in the manufacture of high-phosphorus iron. One of the limiting factors in the iron trade is the ore supply. Imports have scarcely kept pace with the heavy requirements of the blast furnaces, and that is one of the reasons behind the Government's desire to negotiate a trade agreement with Spain. Meanwhile, hematite is now as scarce as, or even scarcer than, common foundry iron and both grades are strictly rationed.

The market for re-rolled products is not within sight of saturation point. Home and export demand is as strong as ever, despite keener Belgian competition. Inquiries for steel sheets are particularly urgent, but the mills cannot take on any more orders until they are assured of increased supplies of material. The more urgent need is for sheet bars and small billets. Large billets and slabs are in reasonably good supply, but for light material users are now looking hopefully to Belgian steelworks, where there is believed to be a bigger export surplus.

The plate mills are working under extreme pressure. Outputs have been raised to record heights, but there is still a wide gap between supply and demand, and at some of the mills order-books have been closed for the time being. Specifications for the thinner gauges are particularly extensive and, similarly, it is the lighter sizes of sections and joists which are most keenly sought. Rail mills have heavy export commitments, in addition to the regular requirements of the British railways and collieries, while steel tubes and bars figure conspicuously in the export programme.

Non-ferrous Metals

Stockpiling continues to constitute the chief bull point in the non-ferrous metal situation, and a recent statement by the United States Munitions Board shows that the American Government has given orders for an intensification in the overall programme of building up strategic reserves. It is anticipated that copper, lead and zinc consumers may feel the repercussions of this new drive for additional tonnage. In tin it is reported that users are already being kept short owing to the drain into the stockpile. But in spite of this, the market is no more than steady and even if all fears of the reimposition of price "ceilings" were removed, it might not be too easy to start up a bull movement again. Nevertheless, there have been reports in Britain of further advances in value, lead being rumoured as the metal most likely to rise. But in lead a curious situation obtains in this country, for secondary metal is in over-supply and prices of scrap lead have weakened considerably since January 1, when initially there was a sharp increase in value owing to the jump in the virgin lead quotation. In fact, it would probably not be an overstatement to say that there is a glut of lead scrap in the United Kingdom to-day

In New York copper is unchanged at 23½ cents per lb., delivered Valley, and in spite of the shortage caused by the continuation of the strike at the Utah mine of the Kennecott Copper Corporation there is no news of any dealings above that level. In Britain the very low relative price of copper scrap is facilitating a supply of cheap English fire-refined copper ingots which are readily bought by such consumers as are able to produce the necessary licences. The brass trade is fairly brisk, apart from extruded rod, which continues to fall a long way below its wartime peak in spite of the reduction in price made last December. The fact is that extruded brass products are only attractive at really reasonable prices and it is no fault of the manufacturers of rod and sections that the ruling valuation checks demand. The price cut in December amounted to ¾d. per lb. and followed a rise of £14 per ton in zinc; the trade has certainly done its best to persuade consumers to place orders.

DOUBLE GRIP TUBULAR STEEL DEVICES COMPANY, LIMITED, and Double Grip Devices (Operating) Company, Limited, are being wound up voluntarily. Mr. R. M. M. McLaren, Bridgeway House, Hammersmith Bridge Road, London, W.6, is the liquidator in each case.

MR. ARTHUR TITLEY, founder and first president of the Newcomen Society, died recently in his 86th year, after a long illness. After working as a draughtsman for several firms in Birmingham, he carried on, from 1894-1932, in partnership with Mr. C. H. Wall, a consulting practice, in connection with non-ferrous metal rolling, wire and tube drawing, and general engineering.

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